# Reuse of Legacy Data for Vehicle Support within the US Army

**Dr. Raj Iyer**

**US Army Tank Automotive Research Development & Engineering Center (TARDEC)**

**Warren, MI**

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# Outline

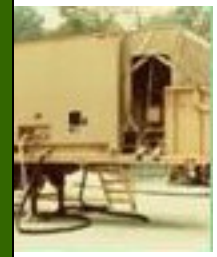
- Need to move to 3D
- Issues with legacy data
- Decision factors
- Methodology
- Conversion issues
- Where we are going
- Demos
- Conclusions

# Need to move to 3D

- Large holdings of legacy 2D drawings in most companies
- Need to redesign (or design new) parts based on older designs
- Need to manufacture spare parts using new machine tools that cannot use legacy data – improved logistic support
- Need to archive designs for future use
- Need to visualize 3D models for non-engineering use
- Virtual prototyping – engineering analysis

# TACOM's product line

o provide engineering & technical suppor
to Army combat vehicle systems to
ensure systems readiness throughout
the lifecycle



# Where we are today

- Have close to a million scanned images in archives – Army vehicles are on an average 30 years old
- Manually converted 20,000 scanned images to 2D CAD drawings
- Manually converted about 2000 2D drawings to Pro/ENGINEER 3D models on FMTV
- Evaluating automated software for 2D to 3D conversions

# Issues with legacy data

- Scanned images
  - Poor scanning resolution
  - Poor quality of hardcopy drawings
  - Multiple sheets because of scanner restrictions
  - Need to be vectorized first

- Vectorized drawings
  - Duplicate and overlapping edges
  - Disconnected and crisscrossing edges
  - Near zero length entities
  - Breakup of entities
  - Incorrect scale factor
  - Ambiguous dimensions

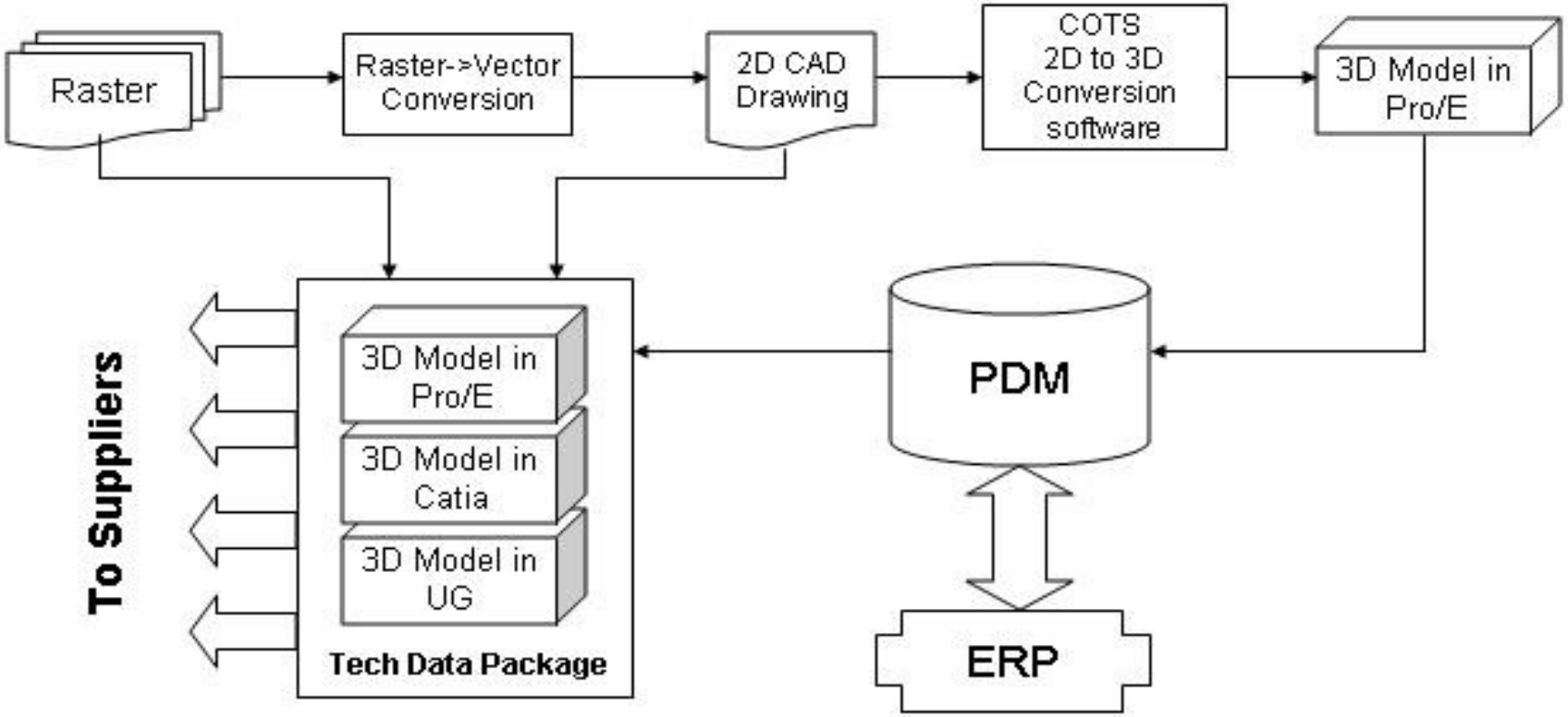
# Conversion decision

- Future production quantities
- Remaining product lifecycle
- Potential for design changes
- Availability and quality of technical data package (TDP)
- Mechanical content
- System density

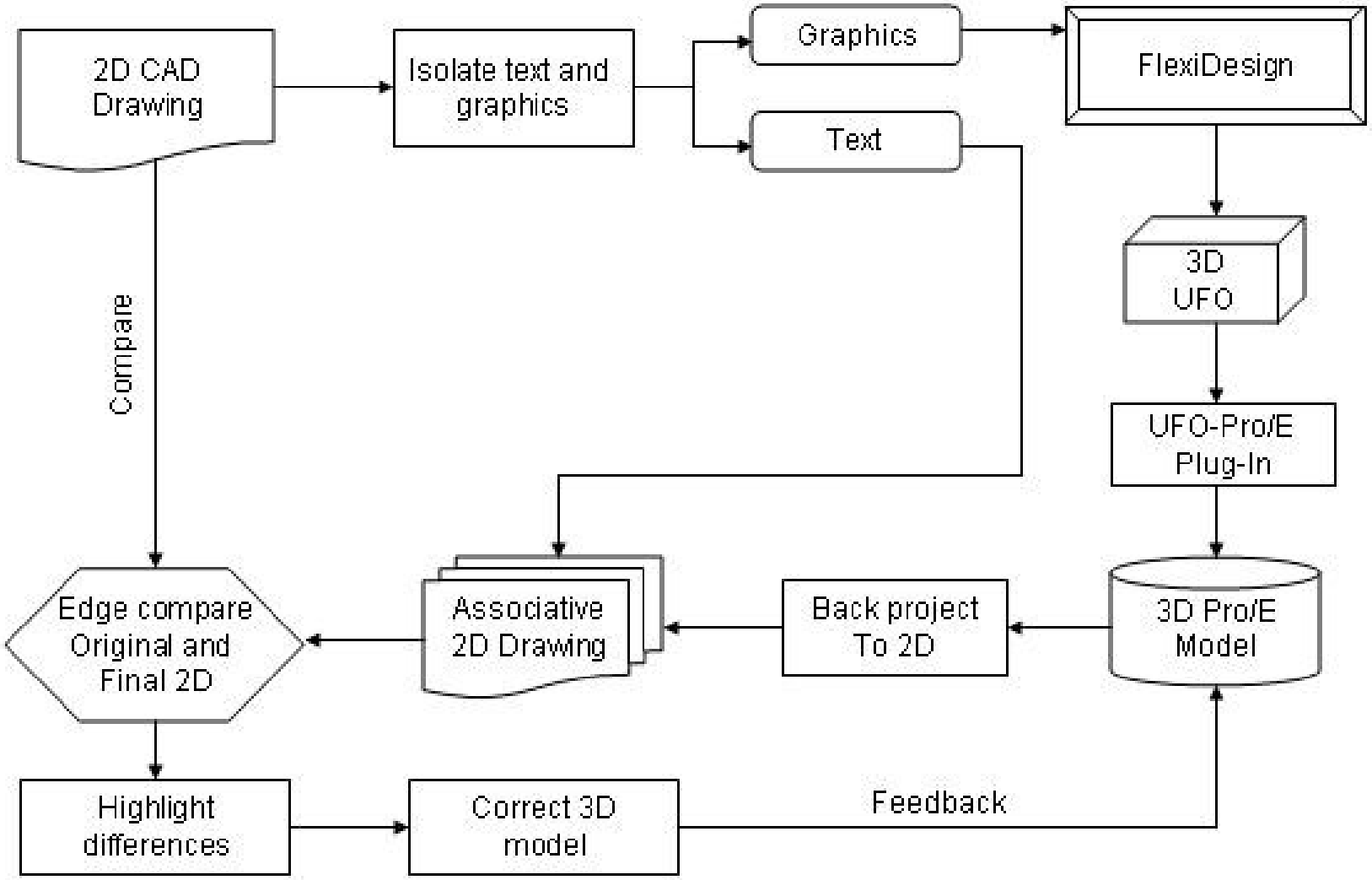
# Conversion requirements

- Governed by “TACOM 3D Modeling Best Practices” document
  - Models must be fully parametric and feature-based
  - Pro/ENGINEER recommended format – but does not preclude other CAD systems
  - Models must have associative 2D drawing with dimensioning scheme consistent with original 2D
  - Material and surface finish to be identified in 3D
  - Layers, colors, notes, file names, …

# System architecture



# Conversion methodology



# Conversion issues

- Works best with machinable piece parts
- Cannot handle assembly drawings
- Accuracy and robustness of conversions
- Preprocessing and post-processing needed
- Automated vs. interactive
- Availability and completeness of data
- Pro/ENGINEER API issues
- Carryover of notes and non-geometric information
- Conformance to TACOM standards

# Process issues

- Can we mandate 3D across the enterprise?
- How to make 3D the official legal document for procurement?
- Do we need to hold on to the 2D?
- How do we manage raster, 2D and 3D concurrently?
- How do we interface with the PDM?
- Are our suppliers capable of handling 3D exclusively?
- Do we have rights to the contractor’s design data?

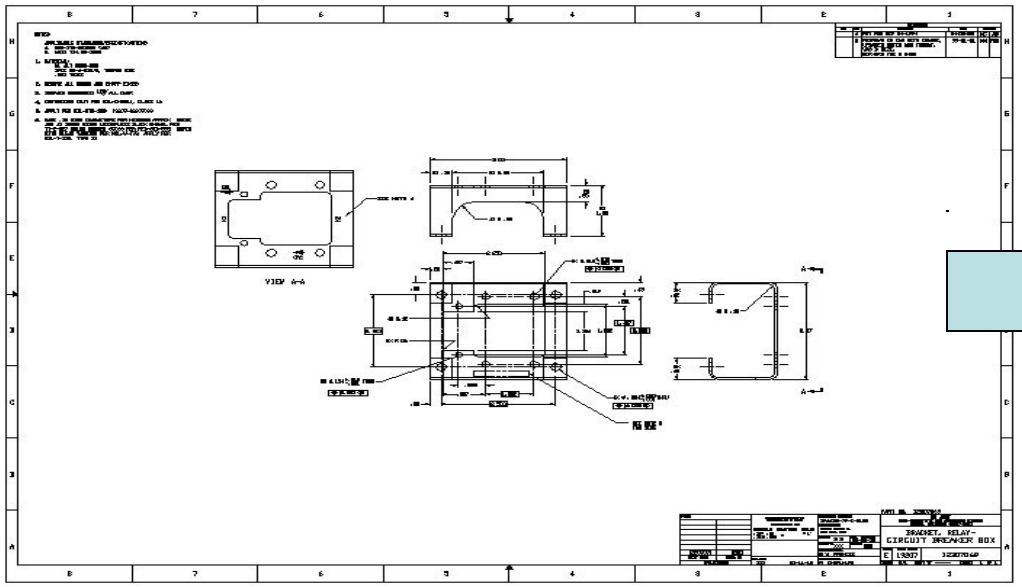
# Where we are going

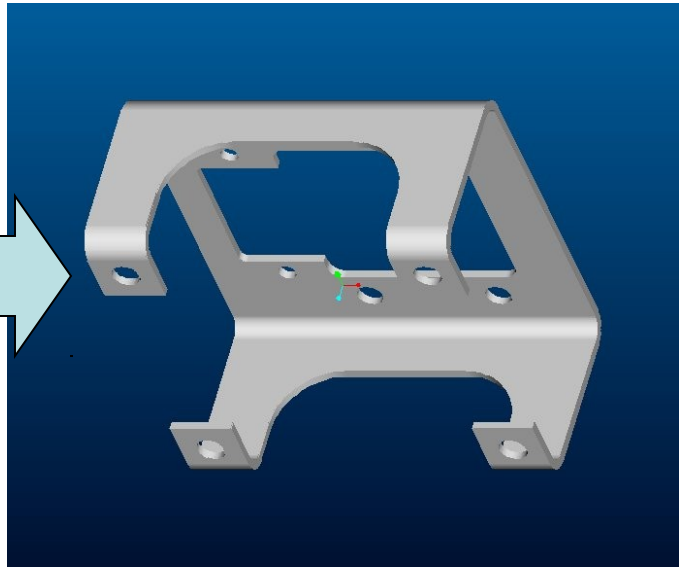
- Working closely with Imagecom in customizing and fine-tuning FlexiDesign for automated conversions
- Standards-based (STEP) approach to archiving and exchanging data
- Feature-based 3D-3D translations where needed
- Strategy for data management throughout the product lifecycle (PLM)
- Evaluating effect on automated manufacturing
- Reverse engineering

# Potential savings

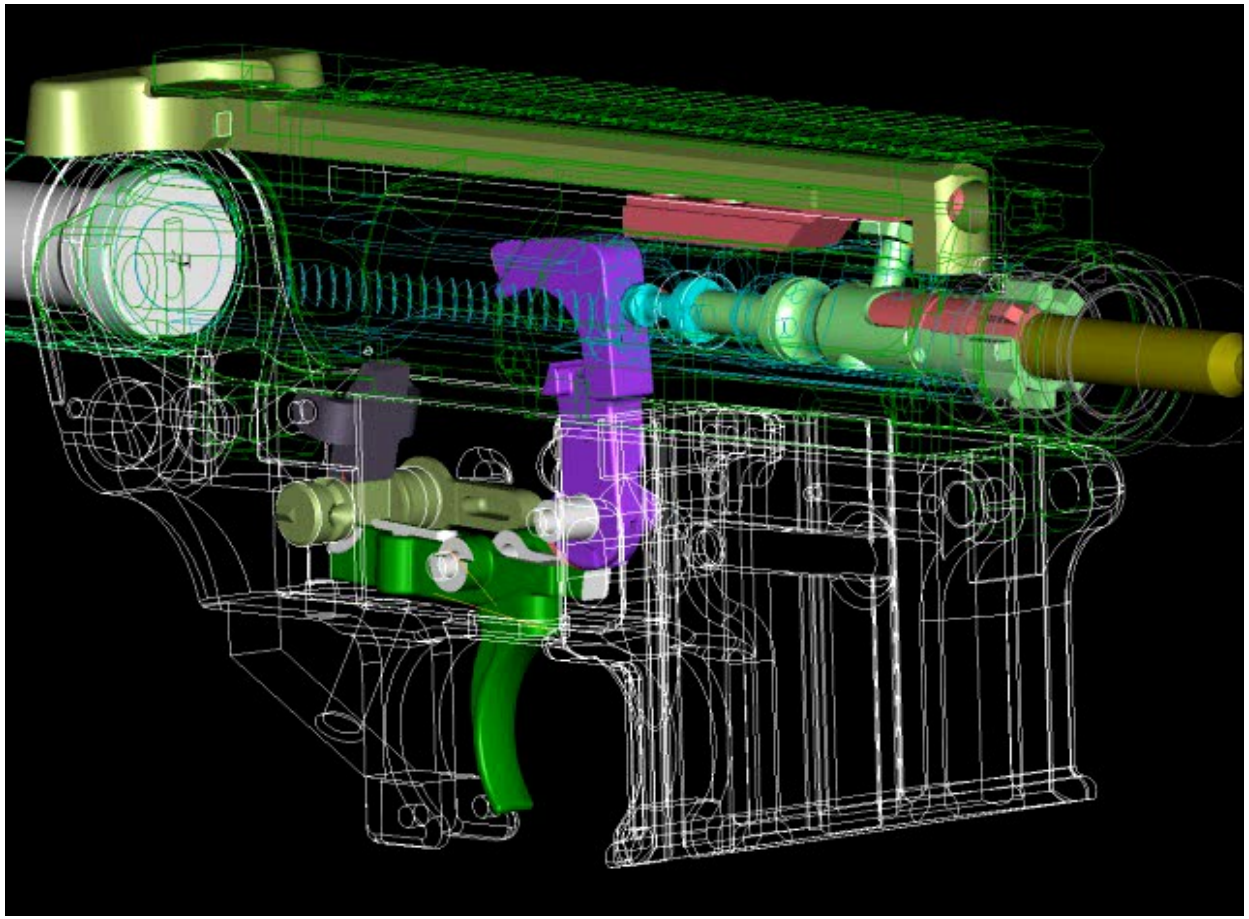
- Automated conversions 4-5 times faster than manual conversions based on pilot conversions
- May not require engineers or 3D modeling experts
- In-house conversions on an as-needed basis possible
- Flexibility in outputs – Pro/E, Catia, UG, SolidWorks
- Lower costs in procuring and manufacturing parts by providing supplier with CAD data that they can directly use

# Demos



# Virtual simulation in 3D



# In summary

- The Army now recognizes the need to move to 3D like private industry
- Take advantage of cost/time savings that auto makers have made by moving to 3D
- Cost-saving automated software are becoming available and affordable today
- Not a 100% solution – but definite productivity improvements over manual conversion approaches

# Contact

- Any Questions?

- For more information:

Dr. Raj Iyer
Engineering Business Group, TARDEC
6501 E. 11 Mile Road
Warren, MI 48313
Tel: 586.574.7186
E-mail: raj.iyer@us.army.mil
http://www.tacom.army.mil/tardec